

UPDATED CONSERVATION STATUS OF PROTECTED MINNESOTA CADDISFLIES

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ABSTRACT

Seven of the 13 Minnesota Trichoptera species with official protected status were located in the state during 1997-2001, including four species – *Agapetus tomus*, *Asynarchus rossi*, *Hydroptila novicola*, and *Polycentropus milaca* – not collected in nearly 40 years. Three species – *Chilostigma itasca*, *Oxyethira ecornuta*, and *Polycentropus milaca* – appear rare in Minnesota, two – *Agapetus tomus* and *Asynarchus rossi* – appear rare but locally abundant, and two – *Hydroptila novicola* and *Oxyethira itasca* – were found throughout northern Minnesota suggesting that they are more abundant than previously thought. Five listed species were not collected during this study and are currently of unknown conservation status. One listed species, *Setodes guttatus*, almost certainly does not occur in Minnesota and should be delisted.

The biological diversity of organisms has become an important scientific topic over the last 15-20 years, largely due to a measured decline in worldwide organismal biodiversity and concern over the potential ecological implications of such a decline (e.g., Readka-Kudla et al. 1997). Documenting the remaining populations of rare species is crucial to their protection (Readka-Kudla et al. 1997, McKamey 1999, Mickevich 1999, Solis 1999). This necessity is particularly profound with insects, a diverse and ecologically important group that is historically poorly known relative to less diverse taxa such as birds and mammals (Mickevich 1999). Documentation of aquatic insect biodiversity, such as that of the caddisflies, takes on an additional measure of importance due to the group's utility in water quality monitoring.

The state of Minnesota lists 13 caddisfly species as either "Endangered" or "Species of Special Concern" (MNDNR 1996). Five species – *Ceraclea brevis* (Etnier) (Leptoceridae), *Chilostigma itasca* Wiggins (Limnephilidae), *Oxyethira itasca* Monson and Holzenthal (Hydroptilidae), *Polycentropus milaca* Etnier (Polycentropodidae), and *Protophila talola* Denning (Glossosomatidae) – are currently known only from Minnesota and may be endemic to the state. Eight of the 13 listed species have not been collected in almost 40 years. Without current population information about these species it is impossible to formulate science-based conservation plans, or even to know if these species remain extant within the state. The objective of this study, therefore, was to survey the state and document populations of all listed species.

MATERIALS AND METHODS

Collections were made from nearly all of Minnesota's 81 watersheds (Fig. 1) (USGS 2002) during 1999–2001. Aquatic habitats were divided into six site classes. Five classes were based on stream width estimated from the sampling site, the sixth constituted lakes and wetlands (Table 1). At least four samples were collected from most of the 58 major watersheds located completely within

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Minnesota (Fig. 1). Each watershed was represented by samples from at least one small stream (Class 1–2), one medium river (3), one large river (4–5), and one lake or wetland (Table 1). Watersheds containing previously known collecting localities of listed species had a greater sampling size than listed above. Watersheds lacking certain habitats, such as small streams, lakes, or large rivers had sample sizes of three. This strategy yielded a broad distribution of sampling sites and a diversity of habitats from throughout the state.

Caddisfly adults were sampled primarily using light traps consisting of an 8-watt portable ultraviolet light placed over a white plastic pan filled with 70% EtOH. These traps were placed adjacent to aquatic habitats at dusk and retrieved approximately two hours later. A total of 244 samples of adult caddisflies were collected during June and July, the peak period of emergence and flight activity for the majority of Minnesota species (Monson 1994). An additional 73 samples were collected during September and early October, the peak period of emergence and flight activity for a minority of species. A grand total of 317 samples were taken from 294 different sites; 23 sites were sampled in both summer and fall.

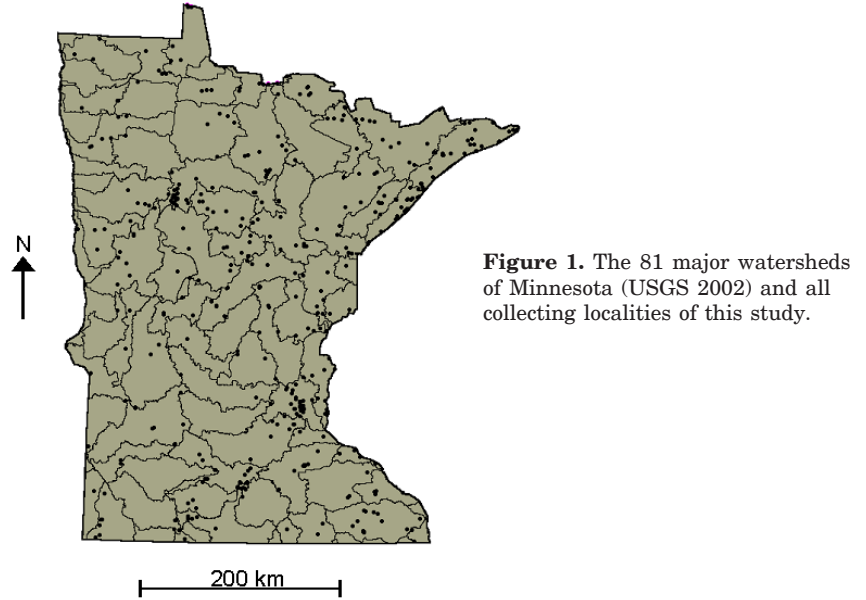


Figure 1. The 81 major watersheds of Minnesota (USGS 2002) and all collecting localities of this study.

Table 1. The six site classes constructed for this study and the total number of samples taken from each during 1999–2001. Stream width was estimated at each sampling site.

Class	Description	Width	Sample Size
1	Small Stream	<2m	24
2	Small/medium Stream	2–4m	37
3	Medium River	4–10m	71
4	Medium/large River	10–30m	54
5	Large River	>30m	20
L	Lake or Wetland	N/A	42

Other sporadic adult collecting techniques included sweep netting and aspiration from riparian rocks and vegetation. These techniques were used mainly to find species that emerge during winter and early spring and rarely fly to lights due to cold weather. Specimens were also examined from the Illinois Natural History Survey (INHS), National Museum of Natural History, Smithsonian Institution (NMNH), University of Minnesota Insect Museum (UMSP), and University of Tennessee Insect Collection (UT). All specimens examined during this study were deposited in the UMSP and entered into its Biota database (Colwell 1996).

RESULTS AND DISCUSSION

Seven caddisfly species listed either as “Endangered” or “Species of Special Concern” by the Minnesota Department of Natural Resources (MNDNR 1996) were collected during this study. Descriptions of these collections are below. The known Minnesota distributions of all seven species are shown in Figures 2–3. Five other listed species: *Ceraclea brevis* and *C. vertreesi* (Dennning) (Leptoceridae), *Protoptila talola* (Glossosomatidae), *Hydroptila metoecca* Blickle and Morse, and *H. tortosa* Ross (Hydroptilidae) were not collected during this study. Their conservation status is discussed on the Minnesota Department of Natural Resources Ecological Services website (<http://www.dnr.state.mn.us/ecological_services>).

The presence of another listed species, *Setodes guttatus* (Banks) (Leptoceridae), is based solely on two specimens collected from “Cass County” in 1936 (Monson 1994). Both of these specimens were reidentified during this study as *S. oligius* (Ross). Thus, *S. guttatus* is now not known to occur within Minnesota. The species is known only from the northeastern U.S. (Holzenthal 1982) and is unlikely to be found in Minnesota.

Endangered Species. A single male specimen of the endangered *Chilostigma itasca* (Limnephilidae) was collected from its type locality, a wet meadow near Nicollet Creek in Lake Itasca State Park, Clearwater County (N 47°11.64', W 95°13.80') during February 2001 (Fig. 2). This species is the sole representative of its genus in North America, and is known worldwide only from the type locality. It is unique in its exclusively winter adult emergence. It was first collected in 1974 and again in 1995.

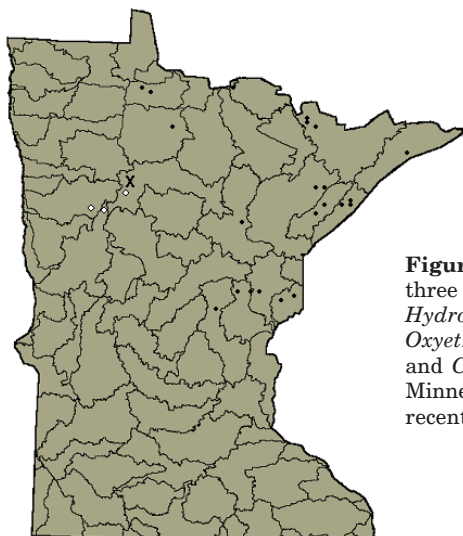


Figure 2. Known distributions of three rare caddisfly species: *Hydroptila novicola* (closed circles), *Oxyethira ecornuta* (open circles), and *Chilostigma itasca* (X) within Minnesota based on all historical and recent collecting.

Species of Special Concern. Three males of *Polycentropus milaca* (Polycentropodidae) were collected in June 2000 from Mabel (N 47°03.08', W 94°04.17') and Big Rice (N 46°59.58', W 93°56.33') Lakes in Cass County. This species was known previously only from the holotype collected at Link (Lynx) Lake, Itasca County (N 47°39.00', W 93°24.50'), in 1965 (Etnier 1968). All sites are within 75 km of each other and are small mesotrophic lakes with abundant littoral vegetation (Fig. 3). *Polycentropus milaca* remains known exclusively from Minnesota (Armitage and Hamilton 1990).

A total of 14 males of *Oxyethira ecornuta* Morton (Hydroptilidae) were collected from the White Earth River, Mahanomen County (N 47°10.83', W 95°48.08'), and Pike Lake, Becker County (N 47°07.75', W 95°31.50'), during July 2000. This species was previously known in Minnesota from a single male specimen collected from LaSalle Creek, Lake Itasca State Park, Clearwater County (N 47°14.35', W 95°09.48'), in 1988 (Monson and Holzenthal 1993). All collecting sites are within 50 km of each other (Fig. 2). This species is known from both Canada and Europe, but is rare and localized throughout its range (Monson and Holzenthal 1993). The Minnesota specimens represent the only known occurrence of this species in the United States.

Agapetus tomus Ross (Glossosomatidae), previously known from a single collection in "Pine County" (Etnier 1965), was collected from Aitkin, Morrison, and Pine Counties in east central Minnesota (Fig. 3). A total of 194 specimens were identified from six localities during June 2000 and 2001. Collection sites are within 150 km of each other and range from low to high-gradient small streams and medium rivers. Minnesota populations are disjunct from the other known populations of *A. tomus* in the southeastern U.S., where the species typically occurs in high-gradient mountain streams (Harris et al. 1991). The rarity, habitat disparity, and local abundance of *A. tomus* make it difficult to hypothesize about the specific habitat requirements of this species in Minnesota.

Asynarchus rossi (Leonard and Leonard) (Limnephilidae) adults were collected from Valley Creek, Washington County (N 44°55.07', W 92°48.37'), in October of 1996 (74 specimens) and in September of 1997 (11 specimens). An additional male was collected from Grand Portage Creek, Cook County (N 47°55.05', W 89°40.13'), in August of 2000. Although separated geographically,

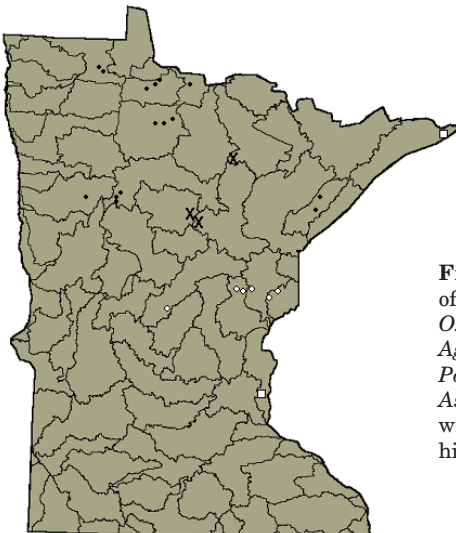


Figure 3. The known distributions of four rare caddisfly species: *Oxyethira itascae* (closed circles), *Agapetus tomus* (open circles), *Polycentropus milaca* (Xs), and *Asynarchus rossi* (open squares) within Minnesota based on all historical and recent collecting.

both collecting sites are high-gradient small-medium streams (Fig. 3). This species is also known from Michigan, Wisconsin, and Quebec, and is rare and localized throughout its range (Monson 1994).

Hydroptila novicola Blickle and Morse (Hydroptilidae), known previously in Minnesota from a single specimen from "Pine County" (Etnier 1965), was found at 28 sites throughout northern Minnesota (Fig. 2). *Oxyethira itasca* (Hydroptilidae), previously thought to be endemic to Lake Itasca State Park (Monson and Holzenthal 1993), was found at 14 sites in northern Minnesota (Fig. 3). Both of these species were found throughout northern Minnesota and the few previous collections may reflect a lack of historical collecting effort.

Recommendations. While it is the objective of this paper to provide conservation data and not to make official recommendations, the data do suggest some potential revisions to the protective status of some listed Minnesota species. *Setodes guttatus* is not known to occur in Minnesota and, thus, should not have official protection within the state. The widespread distributions of *Hydroptila novicola*, both within Minnesota and other areas of the United States (Fig. 2, Harris et al. 1991), may also merit its delisting. Despite the fairly widespread distribution of *Oxyethira itasca* (Fig. 3), its endemism in Minnesota probably warrants maintenance of protection. Maintenance of protection for *Asynarchus rossi*, *Agapetus tomus*, *Oxyethira ecornuta*, and *Polycentropus milaca*, or perhaps strengthening to "Threatened" or "Endangered," is probably fitting now that extant populations of the species have been discovered and their rarity within the state confirmed. In the case of *P. milaca*, "Endangered" status seems particularly appropriate due to the rarity of the species, its low abundance, and its Minnesota endemism. Other species in Minnesota that should probably be added to the list of protected species will be treated in a later paper.

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LITERATURE CITED

- Armitage, B. J. and S. W. Hamilton. 1990. Diagnostic atlas of the North American caddisfly adults. II. Ecnomidae, Polycentropodidae, Psychomyiidae, and Xiphocentronidae. The Caddis Press, Athens, AL.
- Colwell, R. K. 1996. Biota: The biodiversity database manager. Sinauer Associates, Ltd., Sunderland, MA. 574 pp.
- Etnier, D. A. 1965. An annotated list of the Trichoptera of Minnesota, with the description of a new species. Entomol. News 76: 141–152.
- Etnier, D. A. 1968. Range extensions of Trichoptera into Minnesota, with descriptions of two new species. Entomol. News 79: 188–192.
- Harris, S. C., P. E. O'Neil, and P. K. Lago. 1991. Caddisflies of Alabama. Geological Survey of Alabama.
- Holzenthal, R. W. 1982. The caddisfly genus *Setodes* in North America (Trichoptera: Leptoceridae). J. Kansas Entomol. Soc. 55: 253–271.
- McKamey, S. H. 1999. Biodiversity of tropical Homoptera, with the first data from Africa. Amer. Entomol. 45: 213–222.
- Mickevich, M. F. 1999. Scientific aspects of biodiversity databasing. Amer. Entomol. 45: 228–234.
- MNDNR (Minnesota Department of Natural Resources). 1996. Minnesota's list of endangered, threatened, and special concern species. Natural Heritage and Non-game Research Program Publication.
- Monson, M. P. 1994. The caddisflies of the Lake Itasca region, Minnesota, and a preliminary assessment of the conservation status of Minnesota Trichoptera. M.S. thesis, University of Minnesota, Saint Paul.
- Monson, M. P. and R. W. Holzenthal. 1993. A new species and new records of *Oxyethira* (Trichoptera: Hydroptilidae) from Minnesota. J. N. Amer. Benthol. Soc. 12: 438–443.
- Readka-Kudla, M. L., D. E. Wilson and E. O. Wilson. 1997. Biodiversity II: understanding and protecting our biological resources. National Academy of Sciences, John Henry Press, Washington, D.C.
- Solis, M. A. 1999. Insect biodiversity: perspectives from the systematist. Amer. Entomol. 45: 204–205.
- United States Geological Survey (USGS). 2002. Water Resources of the United States. <http://water.usgs.gov/>.